7-1-1985

Plant Tissue Analysis

Jim Gerwing
South Dakota State University

COOPERATIVE EXTENSION SERVICE SDSU

Extension Extra

ExEx 8024
July 1985
Plant Science

COLLEGE OF AGRICULTURE & BIOLOGICAL SCIENCES / SOUTH DAKOTA STATE UNIVERSITY / USDA

Plant Tissue Analysis

by Jim Gerwing, Extension Agronomist-Crops

If you can see something wrong with the crop but can't figure out the cause, plant tissue analysis may give you the best diagnosis. Tissue analysis is particularly good in determining a nutrient deficiency because these symptoms are hard to tell apart in the field.

Nutrient deficiencies are also hard to differentiate from symptoms caused by diseases, herbicide residues, insects, too much or too little moisture, or adverse temperatures. Tissue analysis may be your best bet.

Collecting and handling samples

The touchiest part of tissue analysis is sample collection. Nutrient levels in plants vary with age, the portion of the plant sampled, and numerous other factors. It is essential to collect as outlined in Table 1.

Table 1. Plant sampling instructions.

Plant	Stage of growth	Plant part to sample	Number of plants to sample
Corn	Less than 12 inches tall	Whole plant	20-25
	12 inches to pre-tassel	Uppermost fully developed leaf	25-30
	Tasseling to silk initiation	Leaf below and opposite ear leaf	25-30
Small grain and forage grasses	Seeding to heading	Whole plant	80-100
	Early heading	Top 4 leaves	80-100
Alfalfa or clover	1/10 bloom	Top 6 inches of plant	40-50
Soybeans	Initial flowering to pod set	Uppermost fully developed trifoliate	40-50
Sunflowers	Prior to or at early flowering	Uppermost fully developed leaf	25-30
Grain sorghum	Prior to head emergence	2nd fully developed leaf	25-30

Samples which are dusty or contaminated should be avoided or cleaned with a dry brush or damp cloth. Do not get soil into the sample.

Fresh, green plant tissue will decompose rapidly when shipped in airtight containers such as plastic bags, causing a change in the chemical composition. Therefore, you will have to thoroughly dry samples before shipment.

Dry as rapidly as possible. Forced air drying at 160-175° F is preferred. Open air drying is acceptable if the sample receives adequate ventilation.

Acceptable nutrient levels in plants

When you receive your analysis back from the lab, compare it with Table 2. It shows plant nutrient concentrations which are generally considered to be adequate for optimum crop growth.

Table 2. Sufficient nutrient levels in plants (sampled according to Table 1.

Element	Corn*	Alfalfa	Oats	Barley	Wheat	Soybeans	Sunflowers
N %	2.76-3.50	4.51-5.50	2.00-3.00	2.00-3.00	2.00-3.00	4.51-5.50	2.70-3.20
P %	.25- .40	.26- .70	.20- .50	.20- .50	.20- .50	.26- .50	.25- .50
K %	1.71-2.25	2.01-3.05	1.50-3.00	1.50-3.00	1.50-3.00	1.71-2.50	2.00-3.00
Ca %	.21- .50	1.76-3.00	.20- .50	.30-1.20	.20- .50	.36-2.00	.40-2.00
Mg %	.21- .40	.31-1.00	.15- .50	.15- .50	.15- .40	.26-1.00	.20-1.00
S %	.15- .40	.20- .50	.15- .40	.15- .40	.15- .40	.15- .50	.15- .50
Mn,ppm	20-150	30-100	25-100	25-100	25-100	21-100	20-150
Fe,ppm	21-250	30-250	15-70	15-70	15-70	51-350	50-200
Zn,ppm	20-70	21-70	50-150	50-150	50-150	21-50	15-50
Cu,ppm	6-20	5-14	5-25	5-25	5-25	5-30	5-20
B,ppm	6-25	20-80	5-10	5-10	5-10	11-55	—

*Leaf below and opposite the ear leaf at tasseling.

Yield losses due to a nutrient deficiency usually occur before visual symptoms show up. Even though it is often too late to fertilize after the deficiency is discovered through plant analysis, you will be able to make corrective fertilizer applications for next year's crop.

Notes about sampling techniques

1. It is often easier to diagnose nutritional disorders if two plant samples are taken - one from a good and one from a poor area in the field.

2. Soil samples taken from the same good and poor locations, along

with the plant samples, can increase the chances of correctly determining the problem.

3. Plants that are extremely deficient can have very erratic nutrient concentrations in their tissues because the plants have lost control of their functions. In fields with severe symptoms, it is helpful to sample some plants which are normal, or nearly so, near the severely deficient plants.

4. In some cases, be warned that extreme plant stress due to drought, heat, cold, insects, or disease can cause abnormal nutrient concentrations in plant tissue.

5. When sending plant samples to a lab for diagnosis, include a note listing conditions under which the plants were growing - soil type, moisture, position on the landscape, cropping history, fertilizer and chemicals applied this year and in recent years, and a description of the problem.

6. SDSU provides a plant analysis service. Send samples to:

Soil & Plant Analysis Lab
Plant Science Department
SDSU, Box 2207A
Brookings, SD 57007.

This publication and others can be accessed electronically from the SDSU College of Agriculture & Biological Sciences publications page, which is at http://agbiopubs.sdstate.edu/articles/ExEx8024.pdf